Collecting Ferns in the Choco, Colombia[1]

DAVID B. LELLINGER* and ELIAS R. DE LA SOTA**

The Departamento del Chocó is the northwesternmost department of Colombia. It is about 475 km long, 25–150 km wide, and encompasses about 47,000 km². It lies adjacent to Panamá and touches the Caribbean Sea on the north and the Pacific Ocean on the west (*Fig. 1*). The Chocó is largely an area of tropical lowlands and swamps, but has a few low mountains along the Pacific coast and some slopes and isolated peaks of the Andes, principally in the southeastern part of the Department. The northern two-thirds, between the Serranía de Baudó and the Andes, is drained by the Río Atrato, the southern third largely by the Río San Juan.

The Chocó is sparsely populated. About 50,000 people live in Quibdó, the capital and only large city. Another 160,000 live in small towns, villages, and settlements, mostly along the rivers and coasts. Despite the low population density (ca. 4.5 people per km²), primitive agricultural and lumbering practices, overgrazing, deforestation, and exploitative mining and timbering have destroyed vast areas of natural vegetation. We had a difficult time finding primary or even undisturbed secondary forest in most areas, even though we walked up to 15 km from rivers and roads in an attempt to find the least disturbed collecting areas.

Of the botanists whom we know to have visited the Chocó, the first and most famous is Celestino Mutis (1732–1808), a Spaniard whose name is commemorated by Puerto Mutis, a settlement at the head of Bahía Solano. We have also seen specimens from the Chocó collected by E. P. Killip and J. Cuatrecasas, by J. Araque Molina and F. A. Barkley, by J. Cuatrecasas, by M. A. Arcos, by H. P. Fuchs, and by W. A. Archer. W. Andrew Archer visited the Chocó about 35 years ago; his published observations "Exploration in the Chocó Intendancy of Colombia" (Sci. Monthly **44:** 418–434. 1937) are still relevant today.

The Chocó has a bad reputation among field biologists, and it is largely deserved.[2] Roads are few. The usual means of transportation are motor launch, dugout canoe, and, to some extent, airplane. Except in Quibdó and three or four other towns, medical care is nonexistent. The annual rainfall, particularly in the Quibdó area, nearly sets world records (8,262 mm per year); in the town of Lloró, 24 km southeast of Quibdó, it is said to be about 10,000 mm per year. The high percentage of cloud

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* U. S. National Herbarium, Smithsonian Institution, Washington, DC 20560.
** Museo de La Plata, La Plata, Bs. As., Argentina.

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[2] Scientists contemplating field work in the Chocó may find the Logistical Report and the Medical Report of the Smithsonian Institution–Museo de La Plata Botanical Exploration of the Chocó useful. Copies are available from the senior author of this paper.

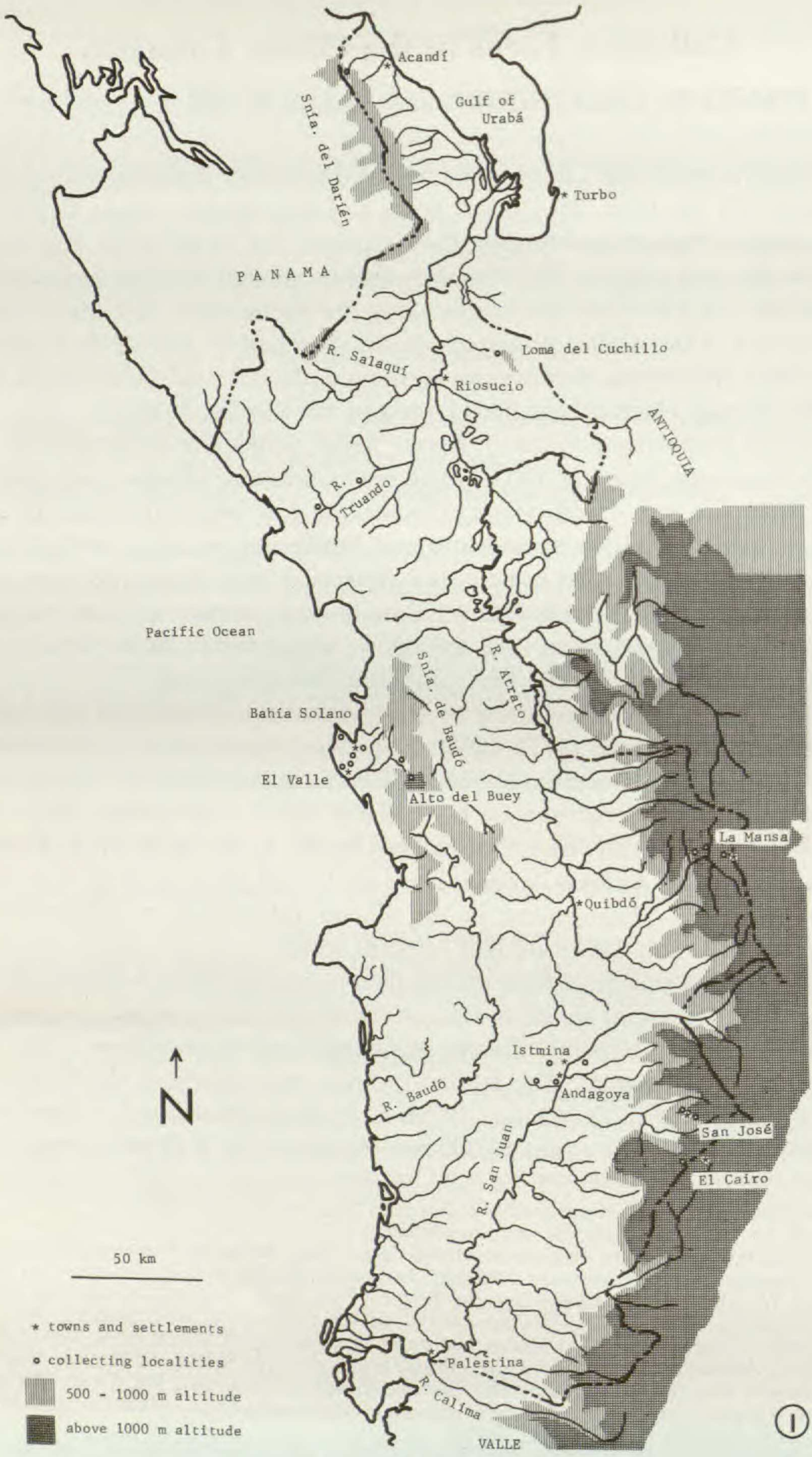

Fig. 1. Map of the Departamento del Chocó, Colombia.

cover keeps temperatures down to tolerable, but still unpleasant, values. We were fortunate because our fieldwork (from January 20 to April 5, 1971) fell during the relatively dry season that usually occurs during the first three months of the year. Although our travels were occasionally slowed by low water in streams, we did not suffer the continual deluges that characterize the Chocó for most of the year.

Because of the few roads leading into the Chocó from the remainder of Colombia, for most of our trips we relied on various twin-engine airplanes to take us to jumping-off points in the Chocó from our base in the large city of Medellín, which is situated about 200 km east from the center of the Chocó in the Aburra Valley in the Cordillera Central. We had excellent working conditions in the herbarium of the University of Antioquia, which has just moved to a new and beautifully designed university city a few minutes from the center of Medellín. The herbarium was begun in 1969 by Prof. D. D. Soejarto, who is building a teaching collection with research specialization in the flora of northwestern Colombia.

At the start of our field work, the Río Atrato was still in flood. Emergency rescue work was being conducted by the government, and so we decided to collect in the Serranía de Baudó area first. We flew to the village of Puerto Mutis (or Bahía Solano, as it is coming to be called). The houses, school, water supply, and portions of nearby roads and bridges were devastated by an earthquake in August, 1970. Eighty percent of the 1,200 residents left after this destruction. The town is slowly rebuilding. Fortunately, we were able to find excellent shelter and capable guides.

To the west and northwest of the village is a steep-sided peninsula with a rather dry lowland forest that we reached by motor launch. We found *Ctenitis protensa* var. *funesta*, *Lindsaea arcuata*, *Lygodium radiatum*, *Metaxya rostrata*, and *Schizaea elegans* to be characteristic of this forest type, both here and along the coast at El Valle. We also collected a tree of the family Lecythidaceae which had violet flowers about 15 cm in diameter growing from its trunk.

From Bahía Solano we explored a trail over the ridges southeast to Miniquía. The secondary forest on the muddy ridges had a much richer fern flora than the bayside hills. Among the ferns we collected were *Danaea moritziana*, *D. nodosa*, *D. wendlandii*, *Tectaria rheosora*, and *Trichomanes pinnatum*, all of which are characteristic of this part of the Chocó. We also collected in wet ravines along the road between Bahía Solano and El Valle.

After making arrangements for our next trip, we flew to Medellín with specimens and returned to Bahía Solano with food and collecting supplies. Our goal was the top of Alto del Buey, at 1810 m the highest point in the Serranía de Baudó. Because the earthquake had destroyed several log bridges, a truck could take us only to Km. 8. We walked four kilometers and, luckily, found the only car in the village of El Valle at the other end of the gap. The best accomodations in town were offered to us by the police; they happened to have extra space in their bunk room. The next day the guide and four bearers we had hired poled us eastward up the Río El Valle in two dugout canoes to a thatched-roof hut that the government had built as a school for the Baudó Indians of the area. We enjoyed talking with the Indians, learning about their crops, foods, and medicines, and seeing the various things they made for their houses and plantations. Once they found out that we were botanists, they

Fig. 2. The camp on Alto del Buey, ca. 1250 m altitude. Fig. 3. San José del Palmar, with the forested ridge to the east, ca. 1600 m altitude.

asked many questions about improving their crops. We hired one of the Indian men to help guide us up Alto del Buey. After an hour's travel the next morning, we turned southeastward into the much smaller Río Mutatá. Soon the canoes had to be beached, and we walked for several hours along and through the rocky stream to a high sandbar not far from the ridge leading to Alto del Buey. The men constructed a shelter roofed with palm fronds and made tight with plastic sheets we carried, where we stayed two days.

The flood-plain forest was undisturbed, other than by occasional flooding, and bore a rich fern flora. We found many of the same species that grew near Bahía Solano, but also *Diplazium brasiliense*, *D. seemannii*, a new species of *Diplazium* sect. *Anisogonium*, *Elaphoglossum proliferans* (the second record for Colombia), several new species of *Elaphoglossum* and *Trichomanes gourlianum*, an unusually large, pinnate-pinnatifid species of subg. *Didymoglossum*.

The following morning, while some of the men cleared a trail up Alto del Buey and began to build a shelter half way up for succeeding days, we explored the steep hillside behind the camp and flood plain. The abundant and varied aroids and the salmon-colored begonias more than two feet tall were more spectacular than the ferns, although we did collect several species of ferns that we had not seen on the flood plain, including *Bolbitis nicotianifolia* and *Trichomanes ankersii*, which has a thin rhizome that creeps up smooth tree trunks and somewhat bipinnatifid fronds that are adherent to the trunk.

The next day we waded up the Río Mutatá to the base of the ridge leading to Alto del Buey. Allowing the guides carrying supplies to precede us, we walked up slowly, collecting as we went. The flora was much the same as on the hillside behind the flood plain. By early afternoon we reached the shelter, which was nearly complete. We helped to set up camp, and then pressed and took notes on the day's collection (*Fig. 2*). The weather remained good, with only occasional drizzles, and so we hoped for a pleasant climb through the mossy forest to the top on the following day.

We were not disappointed, either in the weather or the ferns. The mossy forest proved to be the richest of any we found in the Chocó. Especially notable were the abundant Polybotryas, including *P. cervina*, *P. lechleriana*, *P. osmundacea*, and a new species. We found eight species of *Elaphoglossum*, including three new ones. Two Andean elements otherwise rare in the Chocó, *Blechnum* and *Lophosoria*, were also present. The number of Aspleniaceae (1) and Grammitidaceae (6) were fewer than we expected, which we attributed to the short but noticeable dry season. At the top, which has been cleared and an aluminum reflector placed for cartographic triangulation, we found magnificent views south along the Serranía. The forest appeared unbroken on ridge after ridge, much like that of the national forests in the southern Applachian mountains.

Our third trip was to the upper Río San Juan region. We made our headquarters in the old town of Istmina, where there is a comfortable tourist hotel at the edge of the river. We engaged guides with a dugout canoe to take us to the Mojarras de Tadó, a group of sugar-loaf mountains 8.5 km to the east of Istmina. Most of the area had been logged or cropped at one time or another, but near the base of the

mountains were ravines with *Adiantum kalbreyeri*, *Saccoloma inaequale*, and a new species of *Thelypteris* sect. *Steiropteris*. The talus slope was interesting, too. We found *Thelypteris turrialbae*, a new record for Colombia. We were glad that the guides led the way, for we had an encounter with poisonous snakes; the guide killed two small Bothrops in close succession as we were making our way down an old logging trail. The local people, most of whom walk barefoot, have developed the necessary ability to spot such hazards. They rarely leave their houses without carrying a machete for defending themselves.

One hot and sunny day we walked along the road that runs west from Istmina to Pie de Pepé, which is the head of navigation for the Río Pepé and which was a principal entrance to the area prior to the time of airplanes. Collecting was poor. We returned tired and discouraged, but among the collections were *Lycopodium trianae* and *Thelypteris polyphlebia*, both fairly rare species.

In order to see how uniform the fern flora was in this area, we took a motor launch down the Río San Juan to Andagoya, where we hired two boys with a dugout canoe to pole us down the Río San Juan and westward up the Río Suruco and Río El Salto to a gold and platinum mine run by Mr. Gustave Meade, a transplanted and thriving Texan. The fern flora in the ravines and on the low hills was much the same as we had found at Istmina. We collected *Tectaria acutiloba*, *Trichomanes diversifrons*, and *T. osmundoides*, all characteristic of the fern flora of the upper Río San Juan. We also found some new species of *Elaphoglossum*, one of *Thelypteris* sect. *Steiropteris*, and *Tectaria draconoptera*.

Because we have access to J. Cuatrecasas' collections from the lower Río San Juan and vicinity and to H. P. Fuchs' collections from the Río Baudó, we decided to devote the remainder of the time we could spend in the lowland Chocó to the northern portion. We flew to Turbo, in northern Antioquia at the edge of the Gulf of Urabá. Thanks to the INDERENA staff stationed there, we were able to use their motor boat and driver to go across and through the waves on the gulf (we got thoroughly soaked) and up the Río Atrato to the inundated town of Riosucio. It is possible to fly there only during the dry season, after the Río Atrato recedes. We likened the town to a tropical Venice, because the streets were shallow canals, but with plank bridges from the very narrow plank sidewalk in the middle of the street to each house or store. The next day we went by motorized dugout canoe up the Río Truando to the INDERENA camp at La Teresita, which is close to secondary forest in good condition. The climate here is somewhat drier than at Istmina, and this is reflected in the ferns that we found. *Adiantum petiolatum*, *A. pulverulentum*, *A. tetraphyllum*, *Diplazium cristatum*, *D. delitescens*, and several species of *Campyloneurum* are characteristic.

We also visited the MADUREX lumber camp farther up the Río Truando, which is located in forest less disturbed than that at La Teresita, and which was richer in epiphytes, including *Elaphoglossum apodum*, *E. curvans*, *E. herminieri*, *E. palmense*, *E. rigidum*, *E. tovarense*, and two new species of that genus, plus *Trichomanes curtii* and *T. sublabiatum*. Part of the trip to and from the lumber camp was made in a Timber-Trac, an immensely powerful and noisy diesel tractor with tires six feet high. It went through streams and mud five or six feet deep, carrying us and our

gear and pulling a gasoline tank on wheels behind. It ground along at about one mile an hour, which added up to the slowest and two most uncomfortable hours we spent in the Chocó.

The only totally unsucessful trip we took was from Riosucio to the upper Río Salaquí. The entire area was once a dry forest, but it had been reduced to crop and grazing lands, with only the unusable Bombacaceae left standing. These enormous trees, some 150 feet tall, have swollen lower trunks, as if they contained more water pressure than they could bear. This area clearly had a monsoon climate, and at the time we visited (early March) was quite dry. We were able to make arrangements to use a small helicopter for reconnoitering Loma del Cuchillo, thanks to the Colombian Gulf Oil Company, which had established a survey camp on the upper Río Salaquí.

It is easier to fly over Loma del Cuchillo than to go there by boat or on foot. Because of the low water in the Río Atrato and its tributaries, the motorized dugout canoe and guides we hired in Riosucio were unable to reach the Loma by boat. Instead, we had to beach the boat and walk for half a day, through weedy, once-cultivated fields and through the forest on low ridges near the west end of the Loma. We made a base camp at a comfortable, thatched-roof farm house that belonged to the uncle of one of the guides.

The next day we climbed the mountain, which is over 500 m high. It was a surprisingly steep and difficult climb, considering its small size. Having a slight case of amoebic dysentery did not add to our comfort or efficiency. We did find *Adiantum wilsonii* and *Bolbitis donnell-smithii*, neither of which is common in the Chocó. Because the Loma is an outlier of the Andes, we thought that it might bear a more or less Andean fern flora, but such is not the case; the ferns we found were by and large typically Chocó species.

The northernmost part of the Chocó is a strip of land lying between the Gulf of Urabá and the ridge of the Serranía del Darién. It is most easily accessible from Acandí, where an old, abandoned railroad bed runs west to the foothills of the Serranía. We penetrated to the base of the main ridge and collected there many species typical of the Costa Rica and Panamá fern flora, including *Adiantum macrophyllum*, *Campyloneurum serpentinum*, *Lastreopsis effusa* var. *guatemalensis*, and *Tectaria euryloba*.

In order to decide upon the altitudinal extent of the Chocó fern flora, we spent the last two weeks of field work in the southeastern part of the Chocó, where the boundary of the Chocó runs along the summit of the westernmost range of the Andes.

To reach the first study area, we flew to Pereira to hire a jeep and driver, who drove us west across the flooded valley of the Río Cauca and up into the Cordillera Occidental. About ten miles from the nearest mountain town, the jeep broke a spring shackle, halting the car. The driver hitched a ride towards the town and returned and installed the part practically without tools, all within an hour and a half!

We stayed briefly at San José del Palmar (*Fig. 3*). Although disturbance limited the number of ferns visible from the road nearby, we made a transect from below 500 m altitude to about 1500 m. According to our observations, the boundary between the Chocó and the Andean fern floras lies at to a little above 1000 m altitude.

Behind the cemetery at San José del Palmar (1100 m) we found a very disturbed secondary forest that contained both Chocó elements like *Diplazium brasiliense* and *Campyloneurum latum* and also Andean elements like *Grammitis lanigera* and *Selaginella poeppigiana*. On the ridge to the east of the village (upper portion of *Fig. 3*), which was at 1550–1650 m, Andean species were more prevalent, including *Asplenium hastatum*, *Blechnum tomentosum*, *Microstaphyla colombiana*, *Pteris speciosa*, and *Thelypteris praetervisa*.

We also drove farther south along the Cordillera Occidental to the town of El Cairo. From there we went on mule and horseback southward to the Serranía de Los Paraguas, an aptly named range, although more than umbrellas would have been necessary to ward off the almost continuous downpours. The trail was rough and muddy, often with deep pockets made by the animals' treading in one another's footsteps. We were very fortunate to find a small farmer's cottage with an ample front porch that we could sleep, eat, and prepare specimens on.

Although the forest was disturbed, secondary, and in some places served as a shelter for cattle when the pastures became too unbearably cold and wet, we found that the disturbance increased the diversity of ferns, probably by opening up a wide variety of microhabitats. At this point the dividing ridge between the Chocó and the Departamento del Valle lies at 2200–2250 m. We collected *Campyloneurum fendleri*, *Elaphoglossum huacsaro*, *Eriosorus hirtus*, *Gleichenia rubiginosa*, two Ecuadorian species of *Grammitis*, *Selaginella schmidtchenii*, and *Thelypteris longicaulis*.

In order to confirm our observations from San José del Palmar and the Serranía de Los Paraguas, we made another trip from Medellín. Again we hired a jeep and driver to drive to a second point in the Cordillera Occidental, where we stayed in the town of Ciudad Bolívar, which is on the road from Medellín to Quibdó.

We collected at several altitudes along the road, which is the only one that penetrates more than a few miles into the Chocó. Because it is an old road, and before that a mule trail, it is almost completely bordered by pastures and farm lands. But we found patches of secondary forest at 750 m altitude that had a fairly typical Chocó fern flora, including one new species of *Cnemidaria* and one of *Thelypteris* sect. *Glaphyropteris*.

A brief stop in a highly disturbed and weedy forest at 1500 m altitude yielded Andean ferns: *Blechnum cordatum*, *Dennstaedtia bipinnata*, and *Polystichum platyphyllum*.

On the following day, we collected at the dividing ridge of the Chocó and the Departamento de Antioquia, west of the town of La Mansa. Here we found a typically Andean fern flora in secondary forest at an altitude of 2100–2200 m: *Asplenium serra*, *Blechnum stipitellatum*, four species of *Elaphoglossum*, five of *Hymenophyllum*, *Hypolepis nigrescens*, *H. parallelogramma*, *Polypodium adnatum*, and *Trichomanes lucens*. The many interesting specimens, the bracing mountain air, and the marvellous views of the mountains made a welcome conclusion to our generally hot and wet exploration of the Chocó.